



General

Guideline Title

ACR Appropriateness Criteria® ovarian cancer screening.

Bibliographic Source(s)

Pandharipande PV, Lowry KP, Reinhold C, Atri M, Benson CB, Bhosale PR, Green ED, Kang SK, Lakhman Y, Maturen KE, Nicola R, Salazar GM, Shipp TD, Simpson L, Sussman BL, Uyeda J, Wall DJ, Whitcomb B, Zelop CM, Glanc P, Expert Panel on Women's Imaging. ACR Appropriateness Criteria® ovarian cancer screening. Reston (VA): American College of Radiology (ACR); 2017. 12 p. [37 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Pandharipande PV, Harvey HB, Javitt MC, Glanc P, Bennett GL, Brown DL, Dubinsky T, Harisinghani MG, Harris RD, Horowitz NS, Mitchell DG, Pannu HK, Podrasky AE, Shipp TD, Siegel CL, Simpson L, Wong-You-Cheong JJ, Zelop CM, Expert Panel on Women's Imaging. ACR Appropriateness Criteria® ovarian cancer screening. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 6 p. [37 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report [Clinical Practice Guidelines We Can Trust](#).

■■■■= Poor ■■■= Fair ■■■= Good ■■■= Very Good ■■■= Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
■■■■	Disclosure and Management of Financial Conflict of Interests

	Guideline Development Group Composition
YES	Multidisciplinary Group
YES	Methodologist Involvement
	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
	Search Strategy
	Study Selection
	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
	Grading the Quality or Strength of Evidence
	Benefits and Harms of Recommendations
	Evidence Summary Supporting Recommendations
	Rating the Strength of Recommendations
	Specific and Unambiguous Articulation of Recommendations
	External Review
	Updating




Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Ovarian Cancer Screening

Variant 1: Ovarian cancer screening. Premenopausal. Average risk.

Procedure	Appropriateness Category	Relative Radiation Level
US pelvis transvaginal	Usually Not Appropriate	O
US pelvis transabdominal	Usually Not Appropriate	O
US color Doppler ovaries	Usually Not Appropriate	O
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	
CT abdomen and pelvis with IV contrast	Usually Not Appropriate	
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	

Procedure	Appropriateness Category	Relative Radiation Level
MRI pelvis without IV contrast	Usually Not Appropriate	O
MRI pelvis without and with IV contrast	Usually Appropriate	
FDG-PET/CT whole body	Usually Not Appropriate	☢☢☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Ovarian cancer screening. Postmenopausal. Average risk.

Procedure	Appropriateness Category	Relative Radiation Level
US pelvis transvaginal	Usually Not Appropriate	O
US pelvis transabdominal	Usually Not Appropriate	O
US color Doppler ovaries	Usually Not Appropriate	O
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	☢☢☢☢
CT abdomen and pelvis with IV contrast	Usually Not Appropriate	☢☢☢☢
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢
MRI pelvis without IV contrast	Usually Not Appropriate	O
MRI pelvis without and with IV contrast	Usually Not Appropriate	O
FDG-PET/CT whole body	Usually Not Appropriate	☢☢☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Ovarian cancer screening. Premenopausal. High risk (personal history or family history or known or suspected genetic predisposition or elevated CA-125).

Procedure	Appropriateness Category	Relative Radiation Level
US pelvis transvaginal	May Be Appropriate	O
US pelvis transabdominal	May Be Appropriate	O
US color Doppler ovaries	May Be Appropriate	O
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	☢☢☢☢
CT abdomen and pelvis with IV contrast	Usually Not Appropriate	☢☢☢☢
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢
MRI pelvis without IV contrast	Usually Not Appropriate	O
MRI pelvis without and with IV contrast	Usually Not Appropriate	O
FDG-PET/CT whole body	Usually Not Appropriate	☢☢☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Ovarian cancer screening. Postmenopausal. High risk (personal history or family history or known or suspected genetic predisposition or elevated CA-125).

Procedure	Appropriateness Category	Relative Radiation Level
US pelvis transvaginal	May Be Appropriate	O
US color Doppler ovaries	May Be Appropriate	O
US pelvis transabdominal	May Be Appropriate	O

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	☢☢☢☢☢☢☢☢☢☢
CT abdomen and pelvis with IV contrast	Usually Not Appropriate	☢☢☢☢☢☢☢☢☢☢
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢☢☢☢☢☢☢
MRI pelvis without IV contrast	Usually Not Appropriate	0
MRI pelvis without and with IV contrast	Usually Not Appropriate	0
FDG-PET/CT whole body	Usually Not Appropriate	☢☢☢☢☢☢☢☢☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

There has been much debate about the role of imaging in ovarian cancer screening based on currently available evidence. Ovarian cancer has low disease prevalence, yet is the leading cause of mortality due to gynecologic malignancy in women in the United States. It is estimated that there will be 22,440 new cancer diagnoses and 14,080 cancer deaths in 2017. The high mortality rate observed is largely due to late detection, as it is commonly discovered only after its widespread dissemination. Metastatic disease is present in 60% of cases at the time of diagnosis and is associated with a low 5-year relative survival rate of 28%. Only 15% of women have organ-confined disease at the time of detection, and these women have a substantially higher 5-year relative survival rate (92%), suggesting that screening could be of benefit if aggressive cancers can be reliably detected at earlier stages.

Cancers that clinically fall under the umbrella of ovarian cancer are now known to have heterogeneous natural histories and tissue origins. Five primary subtypes describe most epithelial ovarian cancers: serous, mucinous, clear cell, endometrioid, and transitional cell. Serous cancers represent the majority of all ovarian cancers, are commonly diagnosed at late stages, and account for most ovarian cancer deaths. Importantly, low-grade and high-grade serous tumors do not define a spectrum but instead reflect distinct tumor biologies. High-grade serous cancers are thought to arise directly from surface epithelium. They commonly demonstrate TP53 mutations and are also associated with *BRCA1* and *BRCA2* mutations. Many high-grade "ovarian" serous cancers are now thought to be extraovarian in origin, arising instead from the distal fallopian tubes (fimbria), as initially suggested by histologic evaluation of specimens from *BRCA* mutation carriers who have undergone prophylactic salpingo-oophorectomy.

The average lifetime risk for developing ovarian cancer for a woman in the United States is approximately 1.3%. Women with certain risk factors are known to be at increased risk, including presence of *BRCA1* or *BRCA2* mutations, strong family history (i.e., first-degree relative, particularly if premenopausal at the time of diagnosis), nulliparity, lack of breastfeeding, lack of hormonal contraception use, and postmenopausal status. Among all risk factors, a genetic predisposition is associated with the highest increase in cancer risk. A recent meta-analysis projected that 20-year-old *BRCA1* and *BRCA2* mutation carriers have 39% and 16% mean cumulative risks of developing ovarian cancer, respectively, by age 70. At present, risk reduction in women with a strong genetic predisposition to ovarian cancer centers on bilateral salpingo-oophorectomy.

By mathematically modeling the behavior of ovarian cancers in hypothetical populations of *BRCA* mutation carriers and average-risk patients, researchers have gained insight into their natural history and have investigated a potential role for screening. Based on their findings, current screening tools are expected to have low effectiveness because of the tendency for small cancers to spread rapidly. Two researchers, when modeling serous cancers in high-risk patients, projected that an annual screening tool for ovarian cancer would need to detect tumors as small as 0.5 cm in diameter in order to achieve a 50% mortality reduction.

After evaluating the current literature on this topic, there is no clear evidence to support screening women of average risk (no personal history, no family history, no known or suspected genetic predisposition, and no elevated CA-125). However, this document provides an update on areas of

investigation that may support a future role for imaging and serum biomarkers in special cases.

Overview of Imaging Modalities

Most of the peer-reviewed imaging literature on ovarian cancer screening to date has evaluated the use of pelvic ultrasound (US), as it is generally considered the first-line imaging modality for evaluation of the adnexa. US is particularly attractive as a potential screening modality as it is inexpensive and does not expose patients to ionizing radiation. Other cross-sectional imaging methods, including magnetic resonance imaging (MRI), fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET), computed tomography (CT), and FDG-PET/CT, have no known or foreseeable role in screening. Attention has also been directed to the role of CA-125 (a widely known serum tumor biomarker) for screening, either alone or in combination with imaging (e.g., US and CA-125).

When evaluating the use of an imaging modality for screening, an important metric to consider is positive predictive value (PPV), which is defined as the number of true-positive cases divided by the total number of test-positive cases. Unlike the sensitivity and specificity of a diagnostic test, PPV incorporates both test performance and disease prevalence. A minimum PPV of 10% has been suggested as necessary for an ovarian cancer screening tool. This implies that at least one cancer should be diagnosed in every 10 patients who undergo salpingo-oophorectomy for suspicion of malignancy. Given the low prevalence of ovarian cancer, very high specificity is needed for a successful screening tool. At an assumed prevalence of one case per 2,500 postmenopausal women per year, a test with perfect sensitivity (100%) would require a specificity of 99.6% to achieve a 10% PPV, and a test with 50% sensitivity would require an even higher specificity of 99.8%.

Discussion of Procedures by Variant

Variant 1: Ovarian Cancer Screening. Premenopausal. Average Risk

To the Expert Panel's knowledge, the relevant literature on ovarian cancer screening in average-risk women is limited to studies in postmenopausal women.

US

There is currently no evidence to support the use of US or color Doppler for ovarian cancer screening in premenopausal women without risk factors. Most studies discussed in this document have addressed the use of transvaginal US. In general, transabdominal US should be reserved for women in whom transvaginal US is not technically feasible, or used as a complement to transvaginal US.

CT

There is currently no evidence to support the use of CT for ovarian cancer screening in premenopausal women without risk factors.

MRI

There is currently no evidence to support the use of MRI for ovarian cancer screening in premenopausal women without risk factors.

FDG-PET/CT

There is currently no evidence to support the use of FDG-PET/CT for ovarian cancer screening in premenopausal women without risk factors.

Variant 2: Ovarian Cancer Screening. Postmenopausal. Average Risk

US

US has been the most heavily investigated imaging modality for ovarian cancer screening to date, both alone and in conjunction with biomarker screening of serum CA-125. Most studies discussed in this document have addressed the use of transvaginal US. In general, transabdominal US should be reserved

for women in whom transvaginal US is not technically feasible, or used as a complement to transvaginal US. A recent meta-analysis of 10 randomized trials of ovarian cancer screening using US and/or serum CA-125 measurements found that the included trials did not demonstrate a significant reduction in mortality. The studies that are most relevant for decision making concerning ovarian cancer screening in average-risk postmenopausal women are described in the original guideline document. The majority were designed to accrue a dominant population of average-risk postmenopausal women. However, across studies, exclusion criteria intended to exclude high-risk women were heterogeneous. In the University of Kentucky Ovarian Cancer Screening Study, investigators deliberately also included a subset of premenopausal high-risk women, as detailed in the original guideline document. Of note, the methodologic detail provided in the studies does not allow for uniform determination of the use, or potential benefits, of color Doppler. Therefore, the benefits of US performed with, versus without, color Doppler cannot be determined.

MRI

To the Expert Panel's knowledge, there have been no trials evaluating the use of MRI for ovarian cancer screening in women at average risk. Although MRI is a valuable tool for characterizing adnexal masses that are indeterminate based on US features, there has been little interest in its use as a population screening tool given its cost and unclear advantage.

CT

To the Expert Panel's knowledge, there have been no trials evaluating the use of CT for ovarian cancer screening in women at average risk. CT is routinely used for ovarian cancer staging to assess for distant metastases, but it has limited use in the evaluation of the adnexa given its limited ability to distinguish between benign and malignant lesions. For example, in a study of 2,869 postmenopausal women undergoing CT screening colonography, 118 (4.1% of the cohort) had incidentally detected adnexal lesions noted at interpretation. Of these, 80 were referred for additional imaging workup and/or surgery. In the 26 women who underwent surgical excision, no ovarian cancers were identified. Furthermore, four women in the cohort subsequently developed ovarian cancer after a negative CT evaluation. The limited discriminatory ability of CT renders it impractical for use as a screening tool in this setting.

FDG-PET/CT

To the Expert Panel's knowledge, there have been no trials evaluating the use of FDG-PET/CT for ovarian cancer screening in women at average risk. Although FDG-PET/CT is an important oncologic imaging tool for cancer staging and detection of recurrence, it has no clear value for detecting ovarian cancer in asymptomatic individuals. In a systematic review of imaging modalities for preoperative evaluation of adnexal lesions, the sensitivity of PET was substantially lower than that of US or MRI, possibly because of the composition of ovarian neoplasms, many of which tend to be predominantly cystic with small solid components that may be below the size threshold for detection by PET.

Variant 3: Ovarian Cancer Screening. Premenopausal. High Risk (Personal History or Family History or Known or Suspected Genetic Predisposition or Elevated CA-125)

US

Most studies discussed in this document have addressed the use of transvaginal US. In general, transabdominal US should be reserved for women in whom transvaginal US is not technically feasible, or used as a complement to transvaginal US.

To the Expert Panel's knowledge, randomized controlled trials analogous to those in average-risk populations have not been conducted in definitively high-risk populations. Several related studies have been reported, all relatively small in sample size and most of which include a mix of premenopausal and postmenopausal women at high risk. The largest study to date is the UK Familial Ovarian Cancer Screening Study, a single-arm prospective study of 3,563 premenopausal and postmenopausal women with lifetime risk of ovarian cancer $\geq 10\%$ based on family history or a known predisposing genetic mutation. The median participant age at study enrollment was 44.6 years (range, 35-81 years); therefore, the Expert Panel presumed that the majority of high-risk women were premenopausal. Women in the

study were followed over a mean of 3.2 years with a combination of annual transvaginal US and serum CA-125 measurements. The sensitivity of detection of incident ovarian/fallopian tube cancers in the study was 81.3% to 87.5%, depending on whether occult cancers detected at risk-reducing salpingo-oophorectomy were considered false negatives or true positives. The PPV was 25.5%. Of the 13 incident cancers in the study, 4 (31%) were stage I or stage II; however, women who had not undergone screening within 365 days of diagnosis were more likely to have stage IIIc or higher cancer compared with women who had received screening within the past year. The authors concluded that their findings highlight the importance of strict screening adherence, and as a result the screening frequency for phase II of the trial was reduced to 4 months. The results for phase II of the trial are not yet available.

The University of Kentucky Ovarian Cancer Screening Study cohort also included premenopausal women with a family history of ovarian cancer. The study results were reported in aggregate for patients with and without a family history of ovarian cancer. However, the authors note that there was no significant difference in the incidence of malignant or benign ovarian tumors between these groups. Although the results of this single-arm study were promising, a definitive mortality reduction has not been observed in randomized controlled trials.

Other studies of ovarian cancer screening with CA-125 and/or US in high-risk women have not had promising results. Despite higher reported PPV in some studies (expected with higher disease prevalence), aggressive serous cancers—frequently seen in high-risk patients—were typically detected at advanced stages despite screening.

MRI

To the Expert Panel's knowledge, there are no trials for the use of MRI as an ovarian cancer screening tool in high-risk women. MRI is unlikely to be investigated as a screening tool.

CT

To the Expert Panel's knowledge, there are no trials of the use of CT as an ovarian cancer screening tool in high-risk women. CT has a limited role in the evaluation of adnexal lesions and would be an impractical screening modality because of its poor discriminatory ability between benign and malignant adnexal lesions and the associated risks of ionizing radiation.

FDG-PET/CT

To the Expert Panel's knowledge, there have been no trials evaluating the use of FDG-PET/CT as an ovarian cancer screening tool in high-risk women. FDG-PET/CT has poor performance in this setting and is impractical as a screening modality.

Variant 4: Ovarian Cancer Screening. Postmenopausal. High Risk (Personal History or Family History or Known or Suspected Genetic Predisposition or Elevated CA-125)

US

Most studies discussed in this document have addressed the use of transvaginal US. In general, transabdominal US should be reserved for women in whom transvaginal US is not technically feasible, or used as a complement to transvaginal US.

To the Expert Panel's knowledge, randomized controlled trials analogous to those in average-risk populations have not been conducted in definitively high-risk populations. Several related studies have been reported, all relatively small in sample size and most of which include a mix of premenopausal and postmenopausal women at high risk.

In 2006, a secondary analysis of the United States Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial data was performed to compare, within the screening arm, differences in screening outcomes (after the first four rounds of screening) between women of varying risk for ovarian cancer. Risk was classified based on personal history of breast cancer and family history of breast or ovarian cancer. Although the PPV of screening was marginally higher for women in specified moderate- and high-risk

groups compared to those at average risk (PPV of 1.3% and 1.6% in the moderate- and high-risk groups, respectively, compared to 0.7% in the average-risk group), this difference was not statistically significant.

In 2016, researchers published a subgroup analysis of PLCO data to determine whether annual screening with pelvic US and serum CA-125 reduced ovarian cancer mortality in a subgroup of women with a first-degree relative with breast or ovarian cancer. The authors compared outcomes for 11,293 women in the screening group and 11,062 women in the control group, who were followed for a minimum of 10 years. As seen in the parent PLCO study, there was no significant difference in ovarian cancer mortality between the screening and control groups. There was evidence of a stage shift and improved survival among patients with ovarian cancer in the screening group (relative risk, 0.66; 95% CI, 0.47-0.93). The authors acknowledged the potential for standard epidemiologic biases to affect their results, despite specific methodologic measures taken, and emphasized the need for further related investigation in high-risk individuals.

The largest study to date is the UK Familial Ovarian Cancer Screening Study, a single-arm prospective study of 3,563 premenopausal and postmenopausal women with a lifetime risk of ovarian cancer $\geq 10\%$ based on family history or a known predisposing genetic mutation. The median participant age at study enrollment was 44.6 years (range, 35-81 years); therefore, it was presumed that the majority of high-risk women were premenopausal. Women in the study were followed over a mean of 3.2 years with a combination of annual transvaginal US and serum CA-125 measurements. The sensitivity of detection of incident ovarian/fallopian tube cancers in the study was 81.3% to 87.5%, depending on whether occult cancers detected at risk-reducing salpingo-oophorectomy were considered false negatives or true positives. The PPV was 25.5%. Of the 13 incident cancers in the study, 4 (31%) were stage I or stage II; however, women who had not undergone screening within 365 days of diagnosis were more likely to have stage IIIC or higher cancer compared with women who had received screening within the past year. The authors concluded that their findings highlight the importance of strict screening adherence, and as a result the screening frequency for phase II of the trial was reduced to 4 months. The results for phase II of the trial are not yet available.

Other studies of ovarian cancer screening with CA-125 and/or US in high-risk women have not had promising results. Despite higher reported PPV in some studies (expected with higher disease prevalence), aggressive serous cancers—frequently seen in high-risk patients—were typically detected at advanced stages despite screening.

MRI

To the Expert Panel's knowledge, there are no trials for the use of MRI as an ovarian cancer screening tool in high-risk women. MRI is unlikely to be investigated as a screening tool.

CT

To the Expert Panel's knowledge, there are no trials of the use of CT as an ovarian cancer screening tool in high-risk women. CT has a limited role in the evaluation of adnexal lesions and would be an impractical screening modality because of its poor discriminatory ability between benign and malignant adnexal lesions and the associated risks of ionizing radiation.

FDG-PET/CT

To the Expert Panel's knowledge, there are no trials of the use FDG-PET/CT as an ovarian cancer screening tool in high-risk women. FDG-PET/CT has poor performance in this setting and is impractical as a screening modality.

Summary of Recommendations

Ovarian cancer screening is not recommended for average-risk premenopausal women.
Ovarian cancer screening is not recommended for average-risk postmenopausal women, as randomized controlled trials have not demonstrated a definitive mortality benefit in this population.

Ovarian cancer screening with pelvic US may be appropriate for some premenopausal women at increased risk for ovarian cancer; however, strong evidence is not available for this clinical scenario.

Ovarian cancer screening with pelvic US may be appropriate for some postmenopausal women at increased risk for ovarian cancer; however, strong evidence is not available for this clinical scenario.

Abbreviations

CT, computed tomography
 FDG-PET, fluorodeoxyglucose-positron emission tomography
 IV, intravenous
 MRI, magnetic resonance imaging
 US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
0	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢ ☢	0.1-1 mSv	0.03-0.3 mSv
☢ ☢ ☢	1-10 mSv	0.3-3 mSv
☢ ☢ ☢ ☢	10-30 mSv	3-10 mSv
☢ ☢ ☢ ☢ ☢	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Ovarian cancer

Guideline Category

Screening

Clinical Specialty

Family Practice

Internal Medicine

Obstetrics and Gynecology

Oncology

Radiology

Intended Users

Advanced Practice Nurses

Health Care Providers

Hospitals

Managed Care Organizations

Physician Assistants

Physicians

Students

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of imaging procedures for screening for ovarian cancer

Target Population

Women at risk for developing ovarian cancer

Interventions and Practices Considered

Ultrasound (US)

- Pelvis transvaginal
- Pelvis transabdominal
- Color Doppler ovaries

Computed tomography (CT), abdomen and pelvis

- Without intravenous (IV) contrast
- With IV contrast
- Without and with IV contrast

Magnetic resonance imaging (MRI), pelvis

- Without IV contrast
- Without and with IV contrast

Fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET)/CT, whole body

Major Outcomes Considered

- Utility of imaging procedures in screening for ovarian cancer
- Sensitivity and specificity of imaging procedures in screening for ovarian cancer

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Summary

Of the 37 citations in the original bibliography, 24 were retained in the final document.

A literature search was conducted in April 2015 and updated on June 2017 to identify additional evidence published since the *ACR Appropriateness Criteria® Ovarian Cancer Screening* topic was finalized. Using the search strategy described above, 239 articles were found. Four articles were added to the bibliography. The remaining articles were not used due to either poor study design, the articles were not relevant or generalizable to the topic, or the results were unclear or biased.

The author added 8 citations from bibliographies, Web sites, or books that were not found in the literature search, including 5 articles outside of the search date range.

One citation is a supporting document that was added by staff.

See also the American College of Radiology (ACR) Appropriateness Criteria® literature search process document (See the "Availability of Companion Documents" field) for further information.

Number of Source Documents

Of the 37 citations in the original bibliography, 24 were retained in the final document. The literature search conducted in April 2015 and updated in June 2017 found four articles that were added to the bibliography. The author added 8 citations from bibliographies, Web sites, or books that were not found in the literature search, including 5 articles outside of the search date range. One citation is a supporting document that was added by staff.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Definitions of Study Quality Categories

Category 1 - The study is well-designed and accounts for common biases.

Category 2 - The study is moderately well-designed and accounts for most common biases.

Category 3 - The study has important study design limitations.

Category 4 - The study or source is not useful as primary evidence. The article may not be a clinical study, the study design is invalid, or conclusions are based on expert consensus.

The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);

Or

The study may synthesize and draw conclusions about several studies such as a literature review

article or book chapter but is not primary evidence;

Or

The study is an expert opinion or consensus document.

Category M - Meta-analysis studies are not rated for study quality using the study element method because the method is designed to evaluate individual studies only. An "M" for the study quality will indicate that the study quality has not been evaluated for the meta-analysis study.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author assesses the literature then drafts or revises the narrative summarizing the evidence found in the literature. American College of Radiology (ACR) staff drafts an evidence table based on the analysis of the selected literature. These tables rate the study quality for each article included in the narrative.

The expert panel reviews the narrative, evidence table and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the variant table(s). Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Overview

The purpose of the rating rounds is to systematically and transparently determine the panels' recommendations while mitigating any undue influence of one or more panel members on another individual panel members' interpretation of the evidence. The panel member's rating is determined by reviewing the evidence presented in the Summary of Literature Review and assessing the risks or harms of performing the procedure or treatment balanced with the benefits of performing the procedure or treatment. The individual panel member ratings are used to calculate the median rating, which determines the panel's rating. The assessment of the amount of deviation of individual ratings from the panel rating determines whether there is disagreement among the panel about the rating.

The process used in the rating rounds is a modified Delphi method based on the methodology described in the RAND/UCLA Appropriateness Method User Manual.

The appropriateness is rated on an ordinal scale that uses integers from 1 to 9 grouped into three categories (see the "Rating Scheme for the Strength of the Recommendations" field).

Determining the Panel's Recommendation

Ratings represent an individual's assessment of the risks and benefits of performing a specific procedure for a specific clinical scenario on an ordinal scale. The recommendation is the appropriateness category (i.e., "Usually appropriate", "May be appropriate", or "Usually not appropriate").

The appropriateness category for a procedure and clinical scenario is determined by the panel's median rating without disagreement (see below for definition of disagreement). The panel's median rating is calculated after each rating round. If there is disagreement after the second rating round, the rating category is "May be appropriate (Disagreement)" with a rating of "5" so users understand the group disagreed on the final recommendation. The actual panel median rating is documented to provide additional context.

Disagreement is defined as excessive dispersion of the individual ratings from the group (in this case, an Appropriateness Criteria [AC] panel) median as determined by comparison of the Interpercentile Range (IPR) and the Interpercentile Range Adjusted for Symmetry (IPRAS). In those instances when the IPR is greater than the IPRAS, there is disagreement. For a complete discussion, please refer to chapter 8 of the RAND/UCLA Appropriateness Method User Manual.

Once the final recommendations have been determined, the panel reviews the document. If two thirds of the panel feel a final recommendation is wrong (e.g., does not accurately reflect the evidence, may negatively impact patient health, has unintended consequences that may harm health care, etc.) and the process must be started again from the beginning.

For additional information on the ratings process see the Rating Round Information Document (see the "Availability of Companion Documents" field).

Additional methodology documents, including a more detailed explanation of the complete topic development process and all ACR AC topics can be found on the [ACR Web site](#) (see also the "Availability of Companion Documents" field.)

Rating Scheme for the Strength of the Recommendations

Appropriateness Category Names and Definitions

Appropriateness Category Name	Appropriateness Rating	Appropriateness Category Definition
Usually Appropriate	7, 8, or 9	The imaging procedure or treatment is indicated in the specified clinical scenarios at a favorable risk-benefit ratio for patients.
May Be Appropriate	4, 5, or 6	The imaging procedure or treatment may be indicated in the specified clinical scenarios as an alternative to imaging procedures or treatments with a more favorable risk-benefit ratio, or the risk-benefit ratio for patients is equivocal.
May Be Appropriate (Disagreement)	5	The individual ratings are too dispersed from the panel median. The different label provides transparency regarding the panel's recommendation. "May be appropriate" is the rating category and a rating of 5 is assigned.
Usually Not Appropriate	1, 2, or 3	The imaging procedure or treatment is unlikely to be indicated in the specified clinical scenarios, or the risk-benefit ratio for patients is likely to be unfavorable.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current medical evidence literature and the application of the RAND/UCLA appropriateness method and expert panel consensus.

Summary of Evidence

Of the 37 references cited in the *ACR Appropriateness Criteria® Ovarian Cancer Screening* document, all of them are categorized as diagnostic references including 7 well-designed studies, 1 good-quality study, and 9 studies that may have design limitations. There are 16 references that may not be useful as primary evidence. There are 4 references that are meta-analysis studies.

Although there are references that report on studies with design limitations, 8 well-designed or good-quality studies provide good evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Only 15% of women have organ-confined disease at the time of detection, and these women have a substantially higher 5-year relative survival rate (92%), suggesting that screening could be of benefit if aggressive cancers can be reliably detected at earlier stages.
- Ultrasound is particularly attractive as a potential screening modality as it is inexpensive and does not expose patients to ionizing radiation.

Potential Harms

False-positive results can occur with transvaginal ultrasound.

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the American College of Radiology (ACR) Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

- The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.
- ACR seeks and encourages collaboration with other organizations on the development of the ACR Appropriateness Criteria through society representation on expert panels. Participation by representatives from collaborating societies on the expert panel does not necessarily imply society endorsement of the final document.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Pandharipande PV, Lowry KP, Reinhold C, Atri M, Benson CB, Bhosale PR, Green ED, Kang SK, Lakhman Y, Maturen KE, Nicola R, Salazar GM, Shipp TD, Simpson L, Sussman BL, Uyeda J, Wall DJ, Whitcomb B,

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2017

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The funding for the process is assumed entirely by the American College of Radiology (ACR). ACR staff support the expert panels through the conduct of literature searches, acquisition of scientific articles, drafting of evidence tables, dissemination of materials for the Delphi process, collation of results, conference calls, document processing, and general assistance to the panelists

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Women's Imaging

Composition of Group That Authored the Guideline

Panel Members: Pari V. Pandharipande, MD, MPH (*Principal Author*); Kathryn P. Lowry, MD (*Research Author*); Caroline Reinhold, MD (*Panel Chair*); Mostafa Atri, MD; Carol B. Benson, MD; Priyadarshani R. Bhosale, MD; Edward D. Green, MD; Stella K. Kang, MD, MS; Yulia Lakhman, MD; Katherine E. Maturen, MD, MS; Refky Nicola, DO; Gloria M. Salazar, MD; Thomas D. Shipp, MD, RDMS; Lynn Simpson, MD; Betsy L. Sussman, MD; Jennifer Uyeda, MD; Darci J. Wall, MD; Bradford Whitcomb, MD; Carolyn M. Zelop, MD; Phyllis Glanc, MD (*Specialty Chair*)

Financial Disclosures/Conflicts of Interest

Disclosing Potential Conflicts of Interest and Management of Conflicts of Interest

An important aspect of committee operations is the disclosure and management of potential conflicts of interest. In 2016, the American College of Radiology (ACR) began an organization-wide review of its conflict of interest (COI) policies. The current ACR COI policy is available on its [Web site](#) [redacted]. The Appropriateness Criteria (AC) program's COI process varies from the organization's current policy to accommodate the requirements for qualified provider-led entities as designated by the Centers for Medicare and Medicaid Services' Appropriate Use Criteria (AUC) program.

When physicians become participants in the AC program, welcome letters are sent to inform them of their panel roles and responsibilities, including a link to complete the [COI form](#) [redacted]. The COI form requires disclosure of all potential conflicts of interest. ACR staff oversees the COI evaluation process, coordinating with review panels consisting of ACR staff and members, who determine when there is a conflict of interest and what action, if any, is appropriate. In addition to making the information publicly available, management may include exclusion from some topic processes, exclusion from a topic,

or exclusion from the panel.

Besides potential COI disclosure, AC staff begins every committee call with the conflict of interest disclosure statement on the [Web site](#) reminding members to update their COI forms. If any updates to their COI information have not been submitted, they are instructed not to participate in discussion where an undisclosed conflict may exist.

Finally, all ACR AC are published as part of the Journal of the American College of Radiology (JACR) electronic supplement. Those who participated on the document and are listed as authors must complete the JACR process that includes completing the International Committee of Medical Journal Editors (ICMJE) COI form which is reviewed by the journal's staff/publisher.

Dr. Pandharipande reports grants from Medical Imaging and Technology Alliance, outside the submitted work. Dr. Whitcomb reports Liaison to ACR as Member, Society of Gynecologic Oncology, Clinical Practice Committee, and Active Duty US Military Physician through June 30, 2017. The other authors have no conflicts of interest related to the material discussed in this article.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Pandharipande PV, Harvey HB, Javitt MC, Glanc P, Bennett GL, Brown DL, Dubinsky T, Harisinghani MG, Harris RD, Horowitz NS, Mitchell DG, Pannu HK, Podrasky AE, Shipp TD, Siegel CL, Simpson L, Wong-You-Cheong JJ, Zelop CM, Expert Panel on Women's Imaging. ACR Appropriateness Criteria® ovarian cancer screening. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 6 p. [37 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the [American College of Radiology \(ACR\) Web site](#) .

Availability of Companion Documents

The following are available:

ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2017.

Available from the [American College of Radiology \(ACR\) Web site](#) .

ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2015 Feb. 1 p. Available from the [ACR Web site](#) .

ACR Appropriateness Criteria®. Evidence table development. Reston (VA): American College of Radiology; 2015 Nov. 5 p. Available from the [ACR Web site](#) .

ACR Appropriateness Criteria®. Topic development process. Reston (VA): American College of Radiology; 2015 Nov. 2 p. Available from the [ACR Web site](#) .

ACR Appropriateness Criteria®. Rating round information. Reston (VA): American College of Radiology; 2017 Sep. 5 p. Available from the [ACR Web site](#) .

ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2018. 4 p. Available from the [ACR Web site](#) .

ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 2017. 125 p. Available from the [ACR Web site](#) .

ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2017 Mar. 4 p. Available from the [ACR Web site](#) .

ACR Appropriateness Criteria® ovarian cancer screening. Evidence table. Reston (VA): American College of Radiology; 2017. 22 p. Available from the [ACR Web site](#) .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI on February 10, 2006. The guideline developer agreed to not review the content. This NGC summary was updated by ECRI Institute on August 11, 2009. The guideline developer agreed to not review the content. This NGC summary was updated by ECRI Institute on December 19, 2010. The guideline developer agreed to not review the content. This NGC summary was updated by ECRI Institute on November 14, 2012. The guideline developer agreed to not review the content. This NGC summary was updated by ECRI Institute on June 7, 2018. The guideline developer agreed to not review the content.

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